CLAIMS

1. A method of changing at least one of an inclination and an altitude of an object including at least one of a space vehicle, satellite and rocket by generating a combination first Hohmann transfer for the object emanating substantially at least one of,earth orbit and a first heavenly location to arrive at a weak stability boundary (WSB) or WSB orbit at or near at least one of the moon, moon orbit and a second heavenly location and generating a second Hohmann transfer for the object emanating at the WSB or the WSB orbit to return to that at least one of the earth, the earth orbit and the first heavenly location, using a computer implemented process, comprising the sequential or non-sequential steps of:

(a) generating the first Hohmann transfer for convergence of first target variables at the WSB or the WSB orbit;

(b) traveling from a first altitude relative to the at least one of the earth, the earth orbit and the first heavenly location to a weak capture in the WSB or the WSB orbit using the first Hohmann transfer;

(c) optionally performing an inclination change at the WSB or the WSB orbit;

(d) generating the second Hohmann transfer for convergence of second target variables at the at least one of the earth, the earth orbit, the first heavenly location and the second heavenly location from the WSB or the WSB orbit, optionally including the inclination change performed in step (c); and

(e) traveling from the WSB or the WSB orbit to the at least one of the earth, the earth orbit, the first heavenly location and the second heavenly location at a predetermined arbitrary altitude different from said first altitude using the second Hohmann transfer; and

wherein said first and said second transfers are generated using a forward targeting method.

2. A navigational system for changing at least one of an inclination and an altitude of an object including at least one of a space vehicle, satellite and rocket by generating a first Hohmann transfer for the object emanating substantially from at least one of earth, earth orbit and a first heavenly location to arrive at a weak stability boundary (WSB) or WSB orbit at or near at least one of the moon, moon orbit and a second heavenly location and generating a second Hohmann transfer for the object emanating at the WSB or the WSB orbit

to at least one of the earth, the earth orbit, first heavenly location and a third heavenly location, using a computer, wherein the computer implements the sequential or non-sequential functions of:

(a) generating the first Hohmann transfer for convergence of first target variables at the WSB or the WSB orbit;

(b) generating the second Hohmann transfer for convergence of second target variables at the at least one of the earth, the earth orbit, the first heavenly location and the third heavenly location from the WSB or the WSB orbit; and

(c) navigating the object from a first altitude relative to the at least one of earth, the earth orbit and the first heavenly location to a weak capture in the WSB or the WSB orbit using the first Hohmann transfer, and navigating the object from the WSB or the WSB orbit to the at least one of the earth, the earth orbit, the first heavenly location and the third heavenly location at a predetermined arbitrary altitude different from said first altitude using the second Hohmann transfer; and

wherein said first and said second transfers are generated using a forward targeting method.

3. A computer program memory, storing computer instructions for changing at least one of an inclination and an altitude of an object by generating a first Hohmann transfer for the object emanating substantially from at least one of earth, earth orbit and a first heavenly location to arrive at a weak stability boundary (WSB) or WSB orbit at or near at least one of moon, moon orbit and a second heavenly location and generating a second Hohmann transfer for the object emanating at the WSB or the WSB orbit to return to at least one of the earth, the earth orbit, the first heavenly location and a third heavenly location using a computer, the computer instructions including:

(a) generating the first Hohmann transfer for convergence of first target variables at the WSB or the WSB orbit;

(b) iterating step (a) until sufficient convergence to obtain the first Hohmann transfer from a first altitude relative to the at least one of the earth, the earth orbit and a first heavenly location to a weak capture in the WSB or the WSB orbit;

(c) generating the second Hohmann transfer for convergence of second target

variables at the at least one of the earth, the earth orbit, the first heavenly location and the third heavenly location from the WSB or the WSB orbit; and

(d) iterating step (c) until sufficient convergence to obtain the second Hohmann transfer from the WSB or the WSB orbit to the at least one of the earth, the earth orbit, the first heavenly location and the third heavenly location for changing the at least one of the inclination and the first altitude; and

wherein said first and said second transfers are generated using a forward targeting method.

4. A method of changing at least one of an inclination and an altitude of an object including at least one of a space vehicle, satellite and rocket, using a computer implemented process, comprising the sequential or non-sequential steps of:

(a) traveling from a first altitude relative to at least one of the earth, the earth orbit, and a first heavenly location to a weak capture in a weak stability boundary (WSB) or WSB orbit using a first Hohmann transfer;

(b) performing at least one of a maneuver and a negligible maneuver, and optionally performing an inclination change at the WSB or the WSB orbit; and

(c) traveling from the WSB or the WSB orbit to the at least one of the earth, the earth orbit, the first heavenly location and a third heavenly location at a predetermined arbitrary altitude different from said first altitude and optionally at the inclination change using a second Hohmann transfer; and

wherein said first and said second transfers are generated using a forward targeting method.

5. A method according to claim 4, wherein said performing step (b) further comprises the step of performing the negligible maneuver of between 2-20 meters per second at the WSB or the WSB orbit for ejection therefrom.

6. A method according to claim 4, wherein said traveling step (a) further comprises the step of maneuvering by performing a negligible maneuver of between 2-20 meters per second at the WSB or the WSB orbit for at least one of timing and positioning of the object prior to ejection therefrom.

7. A method according to claim 4, wherein the at least one of the WSB or the WSB orbit is realizable at the predetermined arbitrary altitude by specifying a predetermined velocity magnitude of the object, thereby defining a predetermined capture eccentricity.

8. A method according to claim 4, wherein said method performs said steps (a)-(c) in anywhere from approximately 6 to approximately 88 days.

9. A method according to claim 4, wherein the at least one of the WSB or the WSB orbit is nonlinear and being substantially at a boundary of capture and escape, thereby allowing the capture and the escape to occur for a substantially zero or relatively small maneuver.

10. A method according to claim 4, wherein the at least one of the WSB or the WSB orbit is substantially at a boundary of capture and escape, and wherein solar gravitational perturbations influence the first and second Hohmann transfers.

11. A method according to claim 4, wherein the at least one of the WSB or the WSB orbit is substantially at a boundary of interaction between gravitational fields as the object moves.

12. A method according to claim 4, wherein a motion in the at least one of the WSB or the WSB orbit is at least one of parabolic and elliptic.

13. A method according to claim 4, wherein as the object moves in the at least one of the WSB or the WSB orbit, a Kepler energy of the object is slightly negative and substantially near to zero.

14. A method of changing at least one of an inclination and an altitude of an object including at least one of a space vehicle, satellite and rocket, using a computer implemented process, comprising the sequential or non-sequential steps of:

(a) traveling from a first altitude relative to at least one of the earth, the earth orbit and a first heavenly location to a first periapsis at a weak capture in a weak stability boundary (WSB) or WSB orbit using a first Hohmann transfer;

(b) maneuvering by performing a first negligible maneuver at the WSB or the WSB orbit;

(c) optionally performing an inclination change at the WSB or the WSB orbit;

(d) ejecting from the WSB or the WSB orbit by performing a second negligible maneuver; and

(e) traveling from the WSB or the WSB orbit to a second periapsis at the at least one of the earth, the earth orbit, the first heavenly location and a third heavenly location at a predetermined arbitrary altitude different from said first altitude and optionally at the inclination change using a second Hohmann transfer; and

wherein said first and said second transfers are generated using a forward targeting method.

15. A method of changing at least one of an inclination and an initial altitude of an object including at least one of a space vehicle, satellite and rocket, using a computer implemented process, comprising the sequential or non-sequential steps of:

(a) traveling from at least one of the moon, the moon orbit and a first heavenly location to a weak capture in a weak stability boundary (WSB) or WSB orbit using a first Hohmann transfer;

(b) performing at least one of a maneuver and a negligible maneuver, and optionally performing an inclination change at the WSB or the WSB orbit; and

(c) traveling from the WSB or the WSB orbit to the at least one of the moon, the moon orbit, the first heavenly location and a third heavenly location at a predetermined arbitrary altitude different from said initial altitude and optionally at the inclination change using a second Hohmann transfer; and

wherein said first and said second transfers are generated using a forward targeting method.

16. A method of changing at least one of an inclination and an altitude of an object including at least one of a space vehicle, satellite and rocket, using a computer implemented process, comprising the sequential or non-sequential steps of:

(a) traveling from a first altitude relative to at least one of a first planet, first planet orbit and a first heavenly location to a weak capture in a weak stability boundary (WSB) or WSB orbit using a first Hohmann transfer;

(b) performing at least one of a maneuver and a negligible maneuver, and optionally performing an inclination change at the WSB or the WSB orbit; and

(c) traveling from the WSB or the WSB orbit to at least one of the first planet ~~or,~~ the first planet orbit, the first heavenly location and a second heavenly location at a predetermined arbitrary altitude different from said first altitude and optionally at the inclination change using a second Hohmann transfer; and

wherein said first and said second transfers are generated using a forward targeting method.

17. A method of generating a transfer for an object emanating substantially at at least one of earth, earth orbit and a first heavenly location to arrive at at least one of the moon, moon orbit and a second heavenly location using a computer implemented process, comprising the steps of:

(a) entering parameters for said method of generating the transfer;

(b) implementing at least one of a forward targeting process and a forward transfer process by varying the parameters for convergence of target variables at the moon; and

(c) iterating step (b) until sufficient convergence to obtain the transfer from the at least one of earth, the earth orbit and the first heavenly location to the at least one of the moon, the moon orbit and the second heavenly location.

18. A method of traveling from substantially from at least one of earth, earth orbit and a first heavenly location to at least one of the moon, moon orbit and a second heavenly location in a space vehicle or rocket using a transfer, comprising the steps of:

(a) generating the transfer by implementing at least one of a forward targeting process and a forward transfer process by varying parameters for said method until convergence of target variables at the at least one of the moon, the moon orbit and the second heavenly location; and

(b) traveling from substantially at the at least one of the earth, the earth orbit and the first heavenly location to the at least one of the moon, the moon orbit and the second heavenly location using the transfer by the space vehicle or the rocket.

19. A method of generating a transfer for an object emanating substantially at at least one of a first heavenly object, first heavenly object orbit and a first heavenly location to arrive at at least one of a second heavenly object, second heavenly object orbit and a second heavenly location, comprising the sequential, non-sequential or sequence independent steps of:

(a) entering parameters for said method of generating the transfer;

(b) implementing at least one of a forward targeting process and a forward transfer process by varying the parameters for convergence of target variables at the at least one of the second heavenly object, the second heavenly object orbit and the second heavenly location from the first heavenly object, the first heavenly object orbit and the first heavenly location; and

(c) iterating step (b) until sufficient convergence to obtain the transfer from the at least one of the first heavenly object, the first heavenly object orbit and the first heavenly location to the at least one of the second heavenly object, the second heavenly object orbit and the second heavenly location.

20. A method according to claim 19, wherein said iterating step (c) further comprises the step of iterating step (b) until sufficient convergence to obtain the transfer from the at least one of the first heavenly object, the first heavenly object orbit and the first heavenly location to the at least one of the second heavenly object, the second heavenly object

orbit and the second heavenly location via at least one of a weak capture trajectory and a weak stability boundary (WSB) orbit interposed therebetween.

21. A method according to claim 20, wherein said implementing step (b) further comprises the step of generating a trajectory with respect to the at least one of the second heavenly body, the second heavenly body orbit and the second heavenly location comprising at least a negligible maneuver of between 2-20 meters per second at the weak capture trajectory or the WSB orbit for at least one of timing and positioning of at least one of a space vehicle, satellite and rocket, prior to ejection therefrom.

22. A method according to claim 19, wherein said implementing step (b) further comprises the step of implementing the at least one of the forward targeting process and the forward transfer process by varying at least two spherical parameters for convergence of the target variables at the at least one of the second heavenly object, the second heavenly object orbit and the second heavenly location, while maintaining at least one classical variable substantially fixed.

23. A method according to claim 19, wherein said implementing step (b) further comprises the step of implementing the at least one of the forward targeting process and the forward transfer process by varying velocity magnitude VE, and flight path angle *E for convergence of the target variables at the at least one of the second heavenly object, the second heavenly object orbit and the second heavenly location, the target variables including radial distance, rM, and inclination iM.

24. A method according to claim 23, further comprising the steps of:

(d) transforming converged values of VE, *E into classical elements;

(e) transforming the classical elements to spherical coordinates, wherein the spherical coordinates include the converged values of VE, *E, and longitude *E, latitude *E, flight path azimuth/angle with vertical *E are changed.

25. A method according to claim 23, wherein the velocity magnitude VE, and the flight path angle *E are decoupled from the at least one of the second heavenly body, the second heavenly body orbit and the second heavenly location in the transfer.

26. A method according to claim 23, wherein the velocity magnitude VE, and the flight path angle *E are decoupled from angular elements of the at least one of the first heavenly body, the first heavenly body orbit and the first heavenly location including inclination iE, ascending node relative to earth *E, and argument of periapsis relative to the first heavenly body *E.

27. A method according to claim 19, wherein said implementing step (b) further comprises the step of implementing the at least one of the forward targeting process and the forward transfer process comprising a second order Newton algorithm, and wherein the second order Newton algorithm utilizes two control variables including velocity magnitude VE, and flight path angle *E that are varied to achieve at least one of transfer and capture conditions at the at least one of the second heavenly body, the second heavenly body orbit and the second heavenly location using two target variables including radial distance, rM, and inclination iM.

28. A method according to claim 19, wherein said implementing step (b) further comprises the step of generating a trajectory around the at least one of the second heavenly body ~~or~~, the second heavenly body orbit and the second heavenly location comprising a negligible maneuver of between 2-20 meters per second at at least one of a weak stability boundary (WSB), WSB orbit and weak capture trajectory associated with the at least one of the second heavenly body, the second heavenly body orbit and the second heavenly location.

29. A method according to claim 28, wherein the WSB or the WSB orbit is nonlinear and being substantially at a boundary of capture and escape, thereby allowing the capture and the escape to occur for a substantially zero or relatively small maneuver, and wherein solar gravitational perturbations influence the first and second transfers.

30. A method according to claim 28, wherein the at least one of the WSB, the WSB orbit and the weak capture trajectory is substantially at a boundary of interaction between gravitational fields.

31. A method according to claim 28, wherein as at least one of a space vehicle, satellite and rocket moves in at least one of the at least one of the WSB, the WSB orbit and the weak capture trajectory, a Kepler energy of the at least one of a space vehicle, satellite and rocket is slightly negative and substantially near to zero.

32. A method according to claim 28, wherein the at least one of the WSB, the WSB orbit and the weak capture trajectory is realizable at the predetermined arbitrary altitude by specifying a predetermined velocity magnitude of the at least one of a space vehicle, satellite and rocket, thereby defining a predetermined capture eccentricity.

33. A method according to claim 19, wherein the forward targeting process is a second order Newton algorithm.

34. A method according to claim 19, wherein the first heavenly body or the first heavenly body orbit comprises earth or earth orbit, and wherein the second heavenly body or the second heavenly body orbit comprises moon or moon orbit.

35. A method of traveling by an object emanating substantially from at least one of a first heavenly object, first heavenly object orbit and a first heavenly location to arrive at at least one of a second heavenly object, second heavenly object orbit and a second heavenly location using a transfer, comprising the sequential, non-sequential or sequence independent steps of:

(a) generating the transfer by implementing at least one of a forward targeting process and a forward transfer process by varying parameters for said method until substantial convergence of target variables at the at least one of the second heavenly object, the second heavenly object orbit and the second heavenly location; and

(b) traveling from substantially from the at least one of the first heavenly object , the

first heavenly object orbit and the first heavenly location to the at least one of the second heavenly object, second heavenly object orbit and the second heavenly location using the transfer by the object.

36. A spacecraft or satellite implementing a method of traveling from substantially at least one of a first heavenly object, a first heavenly object orbit and a first heavenly location to arrive at at least one of a second heavenly object, a second heavenly object orbit and a second heavenly location using a transfer, wherein the transfer is generated via at least one of said spacecraft, said satellite and a remote system, by implementing at least one of a forward targeting process and a forward transfer process by varying parameters for said method until substantial convergence of target variables at the at least one of the second heavenly object, the second heavenly object orbit and the second heavenly location; and said spacecraft or said satellite travel from substantially at the at least one of the first heavenly object, the first heavenly object orbit and the first heavenly location to the at least one of the second heavenly object, the second heavenly object orbit and the second heavenly location using the transfer.